

NZDE Electrical Engineering Courses

Course Code	Course Name	Learning Outcomes
Compulsory		
DE4101	Engineering Fundamentals	<ol style="list-style-type: none"> 1. Demonstrate an understanding of, and apply, the fundamentals of statics, dynamics and mechanical energy concepts. 2. Evaluate direct stress and strain, and derive elastic properties from tensile test results. 3. Demonstrate an understanding of the engineering properties of fluids and apply the fundamentals of hydrostatics. 4. Demonstrate an understanding of electrical voltage, current and resistance and explain the difference between AC and DC. 5. Demonstrate awareness of the New Zealand Electricity system and describe some of its safety features. 6. Demonstrate an understanding of heat energy and transfer; temperature and humidity of air
DE4102	Engineering Mathematics	<ol style="list-style-type: none"> 1. Manipulate and solve algebraic expressions and equations. 2. Solve, manipulate and apply mathematical functions, including application of graphs where appropriate. 3. Apply the rules and principles of trigonometry using both degree and radian measure. 4. Demonstrate knowledge of differentiation and integration techniques and apply them to solve engineering problems. 5. Demonstrate knowledge and application of one of the following: <ol style="list-style-type: none"> 5.1 Complex numbers, logic expressions and numbers OR 5.2 Basic statistical concepts and techniques.
DE4103	Technical Literacy	<ol style="list-style-type: none"> 1. Utilise information obtained from physical or web based resources in technical problem solving and presentations. 2. Prepare and deliver an oral presentation on a technical subject. 3. Communicate ideas and technical findings in a written format. 4. Create and use pictorial sketches and pictorial/orthographic drawings to current drawing standards as a communication technique to present ideas and data. 5. Demonstrate interpersonal communication skills to develop project Outcomes.

DE4401	Electrical Principles	<ol style="list-style-type: none"> 1. Explain and apply the fundamental principles of DC theory 2. Explain and apply the fundamental principles of AC theory 3. Explain and apply the fundamental principles of basic three phase theory 4. Demonstrate the use of electrical measuring equipment
DE5401	Power Engineering	<ol style="list-style-type: none"> 1. Demonstrate and apply knowledge of three-phase circuit theory. 2. Perform calculations using power in AC circuits. 3. Describe electricity distribution industry meters and metering methods. 4. Demonstrate an understanding of basic earthing and power system protection for ELV/LV installations. 5. Describe electrical and building reticulation system types
DE5408	Introduction to Networks	<ol style="list-style-type: none"> 1. Apply knowledge of the devices and services used to support communications in data networks and the Internet. 2. Apply knowledge of the role of protocol layers in data networks. 3. Apply knowledge of the importance of addressing and naming schemes at various layers of data networks in IPv4 and IPv6 environments. 4. Design, calculate, and apply subnet masks and addresses to fulfil given requirements in IPv4 and IPv6 networks. 5. Explain fundamental Ethernet concepts such as media, services, and operations. 6. Build a simple Ethernet network using routers and switches. 7. Use a command-line interface to perform basic router and switch configurations.
DE5423	CAD Electrical	<ol style="list-style-type: none"> 1. Interpret electrical drawings. 2. Plan and demonstrate correct electrical draughting practice. 3. Produce working drawings for electrical projects. 4. Use CAD software to produce project documentation.
DE4402	Electrical & Electronic Applications	<ol style="list-style-type: none"> 1. Demonstrate and apply knowledge of Engineering drawing and simulation packages. 2. Demonstrate an understanding and apply fundamental principles of electronic switching supplies. 3. Carry out safe working practices in an Electrical environment.

		<ol style="list-style-type: none"> 4. Describe and apply diagnostic processes to faults in electrotechnology equipment. 5. Construct and test an electrotechnology product
DE5403	Electronic Principles	<ol style="list-style-type: none"> 1. Demonstrate an understanding of circuit theorems. 2. Demonstrate an understanding of, and apply fundamental principles of digital electronics. 3. Demonstrate an understanding of, and apply, fundamental principles of power supplies. 4. Demonstrate and understanding of, and apply fundamental principles of analogue electronics. 5. Demonstrate the use of electronic measuring equipment
DE5404	Electrical Machines	<ol style="list-style-type: none"> 1. Demonstrate and apply knowledge of transformer theory (single and three phase to 11kV, & vector groups). 2. Demonstrate knowledge of DC motor and generator operation with appropriate speed control systems. 3. Demonstrate knowledge of and apply the theory of AC SQIM and WRIM induction motors. 4. Demonstrate knowledge of AC motor speed control (DOL, star-delta, Primary resistance, autotransformer, soft-starter, VFD/VSD). 5. Demonstrate knowledge of mechanical gearboxes, toothed and V belt systems as may be applied to reduce the speed of an electric motor. 6. Demonstrate knowledge of AC motor selection for typical applications. 7. Demonstrate knowledge of operating an induction synchronous motor as a generator. 8. Demonstrate knowledge of typical single phase AC and fractional horsepower motors (capacitor start and run, split phase, shaded pole, servo and stepper). 9. Demonstrate knowledge of single phase AC speed control systems
DE5402	PLC Programming 1	<ol style="list-style-type: none"> 1. Demonstrate knowledge of programmable logic controller hardware concepts. 2. Demonstrate and apply knowledge of programmable logic controller software concepts. 3. Demonstrate knowledge of systems associated with PLCs.

		4. Demonstrate and apply to a real world problem any three IEC61131 programming languages, but typically – ladder, function block, and SFC
DE6102	Engineering Project	<ol style="list-style-type: none"> 1. Develop preliminary design(s), based on a given specification, for an engineering project relevant to their strand (Civil, Mechanical, Electrical, Electronics, Fire) 2. Develop a plan or design parameters considering functionality, safety, environmental, cultural and ethical issues 3. Undertake well-defined planning and produce as project output 4. Produce supporting documentation relevant to project output 5. Evaluate compliance of the project output against specification 6. Present findings to an audience in a professional manner
DE6101	Engineering Management	<ol style="list-style-type: none"> 1. Identify the parties involved in an engineering project and evaluate the roles and responsibilities that each has. 2. Apply the fundamentals of project management to a well-defined engineering project. 3. Appraise the procurement process, evaluate contract documentation and prepare cost estimates for a well-defined engineering project. 4. Demonstrate how to administer and supervise projects, contracts and engineering works in accordance with the relevant standards and/or codes of practice. 5. Critically evaluate professional practice principles and their application to an engineering environment.
Electives		
DE6401	Power Systems 1	<ol style="list-style-type: none"> 1. Describe the New Zealand Power System and explain key aspects e.g. system control, basic terminology (GXP, GIP, infinite bus, frequency and load control, spinning reserve, control periods, ripple and load control methods) 2. Describe the types of generation systems in use in NZ (large scale >1000kW – hydro, geothermal, thermal, co-generation). (I.e. an overview) 3. Describe the transmission system (aerial, towers, HVDC).

		<p>4. Describe the distribution system (up to 66kV, cables and aerial, district and zone substations).</p> <p>5. Describe the application of power transformers in a MV and HV environment.</p> <p>6. Describe the process of generator synchronisation.</p> <p>7. Earthing systems for MV and HV networks (direct, isolated, NER, GFN).</p> <p>8. Describe and apply the process of current interruption and selection of appropriate switchgear.</p> <p>9. Describe and apply basic SLD design and perform basic fault levels (e.g. up to 4 generators, 4 transformers and 2 feeders)</p>
DE6420	Protection	<p>1. Demonstrate and understand operating principles of CTs and VTs in terms of various connection types and industry practice.</p> <p>2. Demonstrate knowledge and understanding of protection concepts for generators, aerial conductors, power cables, transformers, busbars and motors</p> <p>3. Demonstrate knowledge and understanding of the various fault types that occur in electrical power systems both LV, MV and HV.</p> <p>4. Describe operation and application of the different power system protection equipment types under common protection scenarios.</p> <p>5. Demonstrate awareness of safety considerations and safe working practices in relation to power protection equipment.</p> <p>6. Demonstrate knowledge and understanding of digital protection and control systems and basic substation design</p>
DE6411	PLC Programming 2	<p>1. Apply advanced PLC programming techniques</p> <p>2. Apply PID (Proportional Integral and Derivative) control.</p> <p>3. Apply data communication concepts to a range of fieldbus systems.</p> <p>4. Integrate commonly used sensors and Human Machine Interfaces (HMI) to a PLC.</p>
DE6421	Sustainable Energy & Power Elect.	<p>1. Describe power switching devices</p> <p>2. Describe power conversion systems</p> <p>3. Demonstrate knowledge of AC to DC conversion</p> <p>4. Demonstrate knowledge of DC to AC and DC to DC conversion</p> <p>5. Demonstrate knowledge of AC to AC conversion</p>

		<p>6. Describe knowledge of Power Control Applications</p> <p>7. Demonstrate knowledge of small to medium scale renewable energy systems covering up to 100kW</p>
DE6409	Electrical Building Services	<p>1. Demonstrate knowledge of building electrical and automation services.</p> <p>2. Test electrical installations.</p> <p>3. Demonstrate knowledge of the importance of electrical earthing systems used in buildings.</p> <p>4. Demonstrate knowledge of methods used to control the environment and security in buildings</p>
DE5418	Engineering Maths 2	<p>1. Understand and analyse graphs.</p> <p>2. Manipulate and solve algebraic expressions and equations.</p> <p>3. Manipulate and apply complex numbers.</p> <p>4. Use matrices to solve problems</p> <p>5. Apply differentiation and integration mathematical techniques to solve engineering problems</p> <p>6. Derivation and solution of differential equations</p>
DE6419	Maintenance Engineering Mgmt	<p>1. Describe modern maintenance philosophies and their alignment with maintenance business goals</p> <p>2. Describe maintenance strategies and their selection</p> <p>3. Distinguish between, and select appropriate maintenance methodologies</p> <p>4. Relate the need for well-developed planning and scheduling as part of the overall maintenance function</p> <p>5. Justify maintenance improvements</p> <p>6. Develop a maintenance improvement strategy or plan</p>
DE5415	Illumination Engineering	<p>1. Demonstrate and apply intermediate knowledge of the given concepts used in illumination technology.</p> <p>2. Apply illumination technology engineering in given applications to an intermediate level</p>
DE5417	Instrumentation/Controls 1	<p>1. Demonstrate knowledge of transmitters and standard transmission signals</p> <p>2. Describe and apply feedback control systems principles and basic block diagrams</p> <p>3. Demonstrate and apply knowledge of actuators and associated control valves</p> <p>4. Demonstrate and apply knowledge of controller strategies</p>

		5. Demonstrate knowledge of controller stability & tuning methods
DE6414	Instrumentation/Controls 2	<ol style="list-style-type: none"> 1. Demonstrate knowledge of measurement principles, and calibration procedures and standards. 2. Apply knowledge of smart sensors and transducers in practical industrial applications. 3. Analyse, select and apply transducers to industrial applications. 4. Prepare and interpret diagrams using ISO standard symbols. (PFD and PIP). 5. Apply knowledge of smart sensors and transducers in practical industrial applications including rotating machinery and motors. 6. Demonstrate an understanding of the Nyquist and Bode stability diagrams. 7. Demonstrate knowledge of a basic control simulation and modelling software package (For example Matlab with Simulink). 8. Demonstrate knowledge of and apply advanced controller design and tuning methods (For example Cascade, feed-forward, ratio, selective, adaptive, fuzzy logic). 9. Build, program, test, and document an automation application to given specifications (for example a single element control loop).
DE5423	CAD electrical	<ol style="list-style-type: none"> 1. Interpret electrical drawings. 2. Plan and demonstrate correct electrical draughting practice. 3. Produce working drawings for electrical projects. 4. Use CAD software to produce project documentation.